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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/552,311

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6644

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EXAMINER

NGUYEN, NGOC YEN M

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/552,311	Applicant(s) OONK ET AL.	
	Examiner Ngoc-Yen M. Nguyen	Art Unit 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 June 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 16, 2008 has been entered.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 14 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 14, step (2), it is unclear what part of the "off-gas stream" is referred to by "the gas stream", the same "portion of the off-gas stream" of step (1) or what?.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 5-8, 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Caren et al (6,357,223).

Caren '223 discloses a method and an apparatus for the reduction of the amount of pollutants, such as carbon monoxide (CO), hydrocarbons (HC), and oxides of nitrogen (NO.sub.x), in the exhaust gas stream produced by the high temperature combustion of fuel. The method and apparatus of the invention are useful with internal combustion engines equipped with at least one catalytic convertor in the exhaust system (note paragraph bridging columns 8-10). The fuel can be gasoline, gasoline-based formulations, diesel fuel, alcohol, natural gas etc. (note column 11, lines 53-56).

Caren '223 discovered that the presence of OH, as well as that of other active or reactive species, such as other free radicals and gaseous molecular intermediates and oxidizers, including O, H, NO₂, H₂O₂, HO₂, and O₃, in the exhaust gases of a combustion engine in the presence of the requisite oxygen, provides a highly effective catalytic conversion of CO and hydrocarbons to non-polluting gas species, i.e., CO₂ and water vapor. The OH and other related free radical and gaseous molecular oxidizers created by reaction of OH with gaseous species in the exhaust stream act as catalysts independent of or in conjunction with the normal catalytic function of the catalytic converter (note column 10, lines 7-18).

The free radicals or other active species can be produced by a corona discharge device mounted within the catalytic converter (note Figure 13 and column 13, lines 51-53). The corona discharge as disclosed in Caren '223 is considered the same as the

claimed "plasma" and since the corona discharge device is mounted within the catalytic converter, the whole "off-gas stream" is being treated in Caren '223.

In a preferred corona discharge device, high voltage power is required, from about 1,000 to 250,000 Hz (= 1-250 kHz) (note column 16, lines 9-12). The value of 1000 Hz (or 1 kHz) is well within the claimed range.

The introduction of radicals and related gaseous oxidizing species into the combustion gas stream upstream of downstream end of the catalyst in a catalytic convertor results in the catalysis of the oxidation of CO and HC in the exhaust gas stream, and provides for the rapid removal of those pollutants. The catalytic conversion of CO to CO₂ and hydrocarbon to CO₂ and H₂O by these oxidizing species occurs on the large surface in the catalytic converter, as well as in the gas phase in the exhaust stream. The enhanced conversion of CO and HC to CO₂ and H₂O by radicals and other active species frees the bulk of the precious metal catalytic surface from participating in these competing reactions. The converter's precious metal sites no longer need to play as strong a role in catalyzing the less reactive hydrocarbon species, such as *methane*, ethane, ethene, benzene and formaldehyde, and, as a result, the catalytic activity at the precious metal sites can be directed toward reduction of nitrogen oxides to nitrogen and other non-polluting gas species (note column 10, lines 30-48). In addition, in internal combustion engines equipped with catalytic convertors, the introduction of radicals and/or active gaseous species also enhances the reduction of NO_x to molecular nitrogen (N₂) (note column 9, lines 46-50). This fairly teaches that the process of Caren '223 is suitable for treating an off-gas containing both methane and NO_x.

The catalytic converter 13 therefore comprises any device that catalytically removes or participants in the removal of at least one pollutant from an exhaust stream generated by burning a fuel, including, but not limited to, those with monolithic or granular ceramic substrates, metallic substrates, or substrates of any kind, and devices with noble metals or any other type of catalytic material. It would also include, without limitation, devices having semiconductor catalysts, such as oxides or sulfides of transition elements, and devices having ceramic-type catalysts, such as alumina, silica-alumina, and zeolites individually, in combination with each other and oxygen storage media such as cerium oxide or in combination with metal catalysts (note paragraph bridging column 11-12).

For the limitation "said off-gas stream is produced by combustion of natural gas in a natural gas engine for combined heat and power generation", it is considered as a product-by-process limitation and the patentability of the claimed process does not depend on the method of generating the off-gas stream, especially when the off-gas stream, i.e. the product in the product-by-process claim is the same as the gas stream containing the same contaminants as disclosed in Caren '223.

The process of Caren '223 anticipates the claimed process.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Caren '223, optionally further in view of the admitted prior art on page 1.

Caren discloses a process as stated in the above rejection.

For the product-by process limitation, when the examiner has found a substantially similar product as in the applied prior art, the burden of proof is shifted to applicant to establish that their product is patentably distinct and not the examiner to show the same process of making. *In re Brown*, 173 USPQ 685 and *In re Fessmann*, 180 USPQ 324.

Optionally, the admitted prior art on page 1 can be applied to teach that it is known in the art that gas engines such as CHP generate an exhaust gas containing methane and NO_x as contaminants that need to be removed. These contaminants are the same as those in the exhaust gas disclosed in Caren '223, thus, it would have been obvious to one of ordinary skill in the art to use the process of Caren '223 to purify to exhaust gas generated by the CHP as suggested by the admitted prior art on page 1.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to treat a portion or all of the exhaust gas stream produced by the high temperature combustion of fuel as long as level of the pollutants, such as CO, HC and NO_x of the exhaust stream can be reduced to an acceptable level.

For claim 4 it would have been obvious to one of ordinary skill in the art to optimize the electric field used to generate the corona discharge in the process of Caren '223 in order to sufficiently produce the desired radicals, active or reactive species.

For claim 9, it would have been obvious to one of ordinary skill in the art to optimize the process temperature in Caren '223 to effectively reduce the amount of pollutants from the exhaust stream. It should be noted that Caren '223 discloses the use of the corona discharge in a catalytic converter, i.e. the exhaust gas is treated with a "plasma" in the presence of a catalyst.

For claims 10-13, Caren '223 discloses that a three-way catalyst is typically used (note column 11, lines 60-62) and the disclosure of the noble metals (note column 12, lines 1-2), fairly teaches Pt, Pd, Rh (note column 3, lines 32-45). Caren '223 does not specifically disclose the phase of the alumina or the exact combinations for the catalyst, however, it would have been obvious to one of ordinary skill in the art to use any known alumina phase and any known combination for the three-way catalyst used in Caren '223.

For claim 14, Caren '223 discloses that a portion of the cleaned exhaust gas stream 21 that has passed through the catalytic converter 13 is taken from the rear exhaust pipe 22, and diverted to the remote radical generator 23. The output 24 of the remote radical generator 23 is enriched with radicals as a result of the action of a corona discharge on the exhaust gas 21, and is introduced into the exhaust gases in the tailpipe 12 upstream of the downstream end of the catalytic converter 13 (note column 12, lines 50-58). If there is any difference in the order of operation, see *Ex parte Rubin*, 128 USPQ 440 (Bd. App. 1959) (Prior art reference disclosing a process of making a laminated sheet wherein a base sheet is first coated with a metallic film and thereafter impregnated with a thermosetting material was held to render prima facie obvious

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claims directed to a process of making a laminated sheet by reversing the order of the prior art process steps.). See also *In re Burhans*, 154 F.2d 690, 69 USPQ 330 (CCPA 1946) (selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results); *In re Gibson*, 39 F.2d 975, 5 USPQ 230 (CCPA 1930) (Selection of any order of mixing ingredients is prima facie obvious.)

Applicant's arguments filed June 16, 2008 have been fully considered but they are not persuasive.

For the 102 rejection:

Applicants argue that Applicants' claim 1 now requires the feature "wherein said off-gas stream is produced by combustion of natural gas in a natural gas engine for combined heat and power generation".

This limitation is considered as a product-by-process, note "is produced by" language. This limitation does not render the claimed process of treating the off-gas novel or unobvious.

Applicants argue that Caren does not support the application of their corona discharge device for use in any other specific type of engine other than an automotive engine.

It should be noted that Caren '223 discloses that the combustion gas stream may be that of a catalytic combustor, internal or external combustion engine, furnace, boiler, fuel cell catalytic fuel reformer, electric power generator, or any other device that obtains energy from the combustion of fuel to which a catalyst can be adapted to reduce

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the emission of pollution (note column 6, lines 51-56), not just to automotive engine as argued by Applicants.

The 103 rejection.

Applicants argue that Caren '223 constitutes non-analogous art.

It should be noted that Caren '223 does disclose that the desire to reduce HC (which would include methane) and/or NO_x among other pollutants from the exhaust gas (note column 11, lines 57-62).

Applicants argue that the gas-fired plants contemplated by the claimed invention are typically power plants which operate on a significant larger scale than automobiles.

It should be noted that Applicants' claims do not require any size of the "natural gas engine" and the claims only that "a portion" of the off-gas be treated, thus, there is no clear evidence to support Applicants' argument that the off-gas stream as required in Applicants' claims is on a "larger scale" than the exhaust gas disclosed in Caren '223.

Applicants argue that the only temperature listed in Caren '223 is "on the order of about 800°".

Caren '223 discloses the above stated temperature "in certain embodiments" not as a required value. It would have been obvious to one skilled in the art to optimize the temperature in the process of Caren '223 depending on the type of catalyst used, the content of the contaminants to be removed and other process conditions in order to effectively reduce the contaminants in the exhaust gases to an acceptable level.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Stickford et al (2003/0213854) is cited to show that CHP can be "micro".

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ngoc-Yen M. Nguyen whose telephone number is (571) 272-1356. The examiner can normally be reached on Part time schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ngoc-Yen M. Nguyen/
Primary Examiner, Art Unit 1793

nmn

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